Biophysico-Chemical Processes Involving Natural Nonliving Organic Matter in Environmental Systems

Little is known about the fundamentals of physico-chemical and biological interfacial reactions and their impact on nonliving natural organic matter (NOM) in nature. To advance the frontiers of knowledge on the subject matter would require a concerted effort of scientists in relevant physical and life sciences such as chemistry, mineralogy, geochemistry, microbiology, ecology, and soil, atmospheric, and aquatic sciences. Environmental science is indeed the fusion of physical and life sciences. Scientific progress in advancing the understanding of NOM in the environment is based ultimately on unification rather than fragmentation of knowledge.

The overall goal of this project is to provide the scientific and professional communities with an up-to-date and critical evaluation by world-leading scientists of the biophysico-chemical processes of NOM in various environmental compartments. The specific objectives are to address (1) the fundamentals and the impact of mineral-organic matter-biota interactions on the formation, nature and properties, transformation, turnover, and storage of NOM in various environmental systems, and (2) state-of-the-art analytical methods for investigating the biophysico-chemical processes involving NOM in nature.

The outcomes of this project will be published as volume II of a recently approved book series to be published by Wiley (see box). The book will also identify gaps in knowledge on the subject matter, thereby providing future directions for research on biophysico-chemical interfacial reactions in natural habitats. This in turn may lead to the subsequent development of innovative management strategies to sustain environmental quality and ecosystem health on a global scale.

In contrast to classical books, which largely focus on separate physicochemical and biological aspects, this book aims to integrate the frontiers of knowledge on NOM in soil, sediment, water, and air.

The book will be co-edited by N. Senesi, B. Xing, and P.M. Huang.

For more information, contact Task Group Chairman Nicola Senesi <senesi@agr.uniba.it>.

www.iupac.org/projects/2006/2006-014-1-600.html

New IUPAC-Sponsored Wiley Book Series
Biophysico-Chemical Processes in Environmental Systems
Series Editors: P.M. Huang and N. Senesi

The IUPAC Chemistry and the Environment Division recently approved the creation of an IUPAC-sponsored book series entitled Biophysico-Chemical Processes in Environmental Systems, which will be published by John Wiley & Sons, Hoboken, NJ. This series addresses the fundamentals of physical-chemical-biological interfacial interactions in the environment and the impacts on: (1) the transformation, transport, and fate of essential nutrients, inorganic and organic pollutants and pathogens, (2) food chain contamination and food quality and safety, and (3) ecosystem health including human health. With rapid developments in environmental physics, chemistry and biology, it is becoming much harder, if not impossible, for scientists to follow new developments outside their immediate area of research by reading the primary research literature. This book series will present a distilled and integrated version of new developments in biophysico-chemical processes in environmental systems.

Volume 1: Biophysico-Chemical Processes of Metals and Metalloids in Soil Environments (for details, see <www.iupac.org/projects/2004/2004-003-3-600.html>)

Trace Elements Analysis: Role of Grain Size Distribution in Solid Reference Materials

Existing guidelines do not report indications for the selection of the most appropriate particle size distribution for reference material. In the case of solid reference material, particle size distribution plays a vital role in the homogeneity of the material and in the minimum representative test portion required for performing trace element analysis. Commonly, matrix reference materials originating from different producers show different particle size distributions. In the case of soil and sediment, particle size distribution ranges from <120 μm to <20 μm.

Finer particles can increase the homogeneity of the material, but the reference material can significantly differ from the real samples routinely analyzed in the laboratories. In the case of contaminated soils, the analyses are usually carried out on test samples with particle sizes of <2 mm, while the related reference materials have particle sizes of <90 μm. The effect of particle size on extractable trace metals in soil reference materials already has been observed (A. Sahuquillo et al., "Certified Reference Materials for Extractable Trace Metals in Soils: Effect of the Particle Size," 1998, *Fresenius J. Anal. Chem.* 304–307). In addition, it is also necessary to point out that the production of reference materials with fine size particle distribution also has a relevant impact on the production costs.

This proposed project, to be carried out within the Analytical Chemistry Division (V), aims to investigate:

1. the influence of grain size distribution on the homogeneity of solid reference materials
2. the influence of grain size distribution on the minimum sample intake for the analysis of different analytes
3. the influence of grain size distribution on the stability of the reference materials
4. the cost associated with the production of reference materials with different particle size distribution

The project, funded by the different participants, began in October 2006. It is being coordinated by the Italian Environmental Protection Agency and involves representatives from the International Atomic Energy Agency, Austria; Institute for National Measurement Standards, Canada; University of Barcelona, Spain; and the National Institute of Standards and Technology, USA.

For more information and to submit comments, please contact Task Group Chairman Maria Belli <maria.belli@apat.it>.

www.iupac.org/projects/2005/2005-035-2-500.html

The Chemistry Clearing House as a Way to Better Chemistry Teaching

With the support of the Russian Academy of Sciences, the Chemistry Clearing House was organized at Mendeleyev's University of Chemical Technology of Russia in order to disseminate information about chemistry and chemical education throughout Russia and the Commonwealth of Independent States. The objective of the Clearing House is to improve the professional skills of teachers in secondary schools, high schools, colleges, and polytechnic schools by disseminating IUPAC-sourced educational and reference materials to educational institutes. The Clearing House helps teachers select the right materials, adapt them to their curricula, and translate them if necessary.

One of the goals of this project was to eliminate the gap in the teaching of chemistry between fundamental science and curricula by adopting educational materials and practices approved by the IUPAC Committee on Chemistry Education (CCE).

Information about the Chemistry Clearing House has been incorporated into the website of Mendeleyev's University of Chemical Technology of Russia. The website (in Russian) <http://gh.muctr.ru> includes the following:

- project information, head coordinators, and participant information
- list of the Education Ministry of Russian Federation documents regarding chemical education and the integration of science and education
- translation of CCE reports
- translations of IUPAC materials regarding chemical terminology
- presentations of new methods and techniques for scientific education

The Chemistry Clearing House achieved its goal of contributing to the public understanding of chemistry and the scientific method. Future curricula will promote the public appreciation of chemistry and the benefits brought to society by the discovery and application of chemical knowledge.

In the future, the Clearing House hopes to work more closely with CCE on educating Russian science teachers. However, it is not enough to simply deliver information regarding IUPAC activities. Instead the system must allow for two-way communication and feedback.

IUPAC ⟷ Chemistry Clearing House ⟷ Russian teachers

The Chemistry Clearing House is a vital component of Russian chemistry education because it helps teachers adopt foreign science teaching methods and take part in an international exchange of information and educational experience.

Other countries should consider developing their own chemistry clearing houses in order to accomplish the following:

- improve chemical education overall
- advance public understanding of chemistry and the scientific method
- exchange information on teaching methods among colleagues around the world
- adapt curricula to technology and industry problems

For more information contact Task Group Chairman Elena S. Gryzlova <ncrc@geokhi.ru>.

www.iupac.org/projects/2001/2001-003-5-050.html

The Project Place

Teaching High-Temperature Materials Chemistry at the University Level

The growth of high-temperature materials chemistry (HTMC) into an increasingly important field of scientific and technological research is due to the continuous demand for new materials and the need for systematic knowledge of their physical and chemical behavior in the conditions required by the new technologies (e.g., space and energy technologies). These materials (e.g., oxide and nonoxide modern multifunctional ceramics, intermetallics), which offer interesting technical applications for such things as surface coatings, electronic components, and advanced turbines, are prepared through high-temperature processing (e.g., transport reactions, CVD, combustion synthesis, laser ablation, and deposition) and must be stable under extreme thermal and chemical conditions.

HTMC now encompasses many fields of science and technology. Its advancement has involved a synergic interchange between basic and applied research, with the application of thermodynamics, kinetics, and a variety of physical, chemical, and modeling techniques to investigate processes and behaviors of materials at temperatures as high as 3 000K to 5 000K.

More than 50 years of studies have demonstrated that the general behavior of materials and reactions at high temperatures often differs dramatically from what we are educated to expect at room temperature. HTMC topics are rarely addressed in chemistry and materials science programs at the university. Therefore, it is important to introduce to students of chemistry and materials science the concepts underlying the behavior of materials and chemical bonding at high temperatures.

The proposed project will provide a resource book of topics in the area of properties and behavior of high-temperature materials for those teaching materials science or physical or inorganic chemistry at various levels. The recommended topics will be accompanied by a bibliography of helpful references and a short introduction or explanation, including the areas of application.

For more information contact Task Group Chairman Giovanni Balducci <giovanni.balducci@uniroma1.it>.

www.iupac.org/projects/2000/2000-024-2-200.html

Provisional Recommendations

Provisional Recommendations are drafts of IUPAC recommendations on terminology, nomenclature, and symbols made widely available to allow interested parties to comments before the recommendations are finally revised and published in Pure and Applied Chemistry.

www.iupac.org/reports/provisional

Standard Definitions of Terms Relating to Mass Spectrometry

This document contains recommendations for nomenclature, definitions of terms, and acronyms in mass spectrometry. In 1974, the IUPAC Commission on Analytical Nomenclature issued recommendations on mass spectrometry terms and definitions. In 1978, the Commission on Molecular Structure and Spectroscopy updated and extended the recommendations and made further recommendations regarding symbols, acronyms, and abbreviations. The Physical Chemistry Division Commission on Molecular Structure and Spectroscopy's Subcommittee on Mass Spectroscopy revised the recommended terms in 1991 and appended terms relating to vacuum technology. Some additional terms related to tandem mass spectrometry were added in 1993 and accelerator mass spectrometry in 1994. Due to the rapid expansion of the field, particularly in mass spectrometry of biomolecules, a further revision of the recommendations has become necessary.

Comments by 31 January 2007

Prof. Kermit K. Murray
Louisiana State University
Department of Chemistry
331 Choppin Hall
Baton Rouge, LA 70803, USA
Tel: +1 225-578-3417
Fax: +1 225-578-3458
E-mail: kkmurray@lsu.edu

www.iupac.org/reports/provisional/abstract06/murray_310107.html